

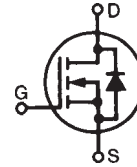
# HiPerFET™ Power MOSFETs Q2-Class

IXFK 38N80Q2  
IXFN 38N80Q2  
IXFX 38N80Q2

$V_{DSS} = 800\text{ V}$   
 $I_{D25} = 38\text{ A}$   
 $R_{DS(on)} = 220\text{ m}\Omega$

$t_{rr} \leq 250\text{ ns}$

N-Channel Enhancement Mode  
Avalanche Rated, High dv/dt, Low  $Q_g$   
Low intrinsic  $R_g$

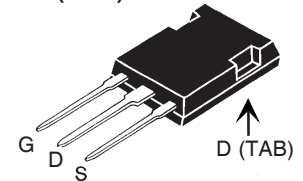


## Preliminary Data Sheet

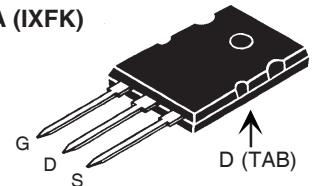
| Symbol     | Test Conditions                                                                                                                               | Maximum Ratings               |                                     |
|------------|-----------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-------------------------------------|
| $V_{DSS}$  | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$                                                                                               | 800                           | V                                   |
| $V_{DGR}$  | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$ ; $R_{GS} = 1\text{ M}\Omega$                                                                 | 800                           | V                                   |
| $V_{GS}$   | Continuous                                                                                                                                    | $\pm 30$                      | V                                   |
| $V_{GSM}$  | Transient                                                                                                                                     | $\pm 40$                      | V                                   |
| $I_{D25}$  | $T_C = 25^\circ\text{C}$                                                                                                                      | 38                            | A                                   |
| $I_{DM}$   | $T_C = 25^\circ\text{C}$ , pulse width limited by $T_{JM}$                                                                                    | 150                           | A                                   |
| $I_{AR}$   | $T_C = 25^\circ\text{C}$                                                                                                                      | 38                            | A                                   |
| $E_{AR}$   | $T_C = 25^\circ\text{C}$                                                                                                                      | 75                            | mJ                                  |
| $E_{AS}$   | $T_C = 25^\circ\text{C}$                                                                                                                      | 4.0                           | J                                   |
| dv/dt      | $I_S \leq I_{DM}$ , $di/dt \leq 100\text{ A}/\mu\text{s}$ , $V_{DD} \leq V_{DSS}$ ,<br>$T_J \leq 150^\circ\text{C}$ , $R_G = 2\text{ }\Omega$ | 20                            | V/ns                                |
| $P_D$      | $T_C = 25^\circ\text{C}$                                                                                                                      | 735                           | W                                   |
| $T_J$      |                                                                                                                                               | -55 ... +150                  | $^\circ\text{C}$                    |
| $T_{JM}$   |                                                                                                                                               | 150                           | $^\circ\text{C}$                    |
| $T_{stg}$  |                                                                                                                                               | -55 ... +150                  | $^\circ\text{C}$                    |
| $T_L$      | 1.6mm (0.063in) from case for 10s (Plus247, TO-264)                                                                                           | 300                           | $^\circ\text{C}$                    |
| $V_{ISOL}$ | 50/60Hz, RMS $t = 1\text{ min}$<br>$I_{ISOL} < 1\text{ mA}$ $t = 1\text{ s}$                                                                  | SOT-227B<br>2500<br>3000      | V~<br>V~                            |
| $M_d$      | Mounting torque<br>Terminal torque                                                                                                            | TO-264<br>SOT-227B            | 0.9/8 Nm/lb.in.<br>1.5/13 Nm/lb.in. |
| $F_c$      | Mounting force                                                                                                                                | PLUS-247                      | 22...130/5...30 N/lb                |
| Weight     |                                                                                                                                               | PLUS247<br>TO-264<br>SOT-227B | g<br>10 g<br>30 g                   |

| Symbol       | Test Conditions                                                                                                             | Characteristic Values<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified) |      |                          |
|--------------|-----------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------|--------------------------|
|              |                                                                                                                             | min.                                                                              | typ. | max.                     |
| $V_{DSS}$    | $V_{GS} = 0\text{ V}$ , $I_D = 3\text{ mA}$                                                                                 | 800                                                                               |      | V                        |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 8\text{ mA}$                                                                                     | 2.0                                                                               |      | 4.5 V                    |
| $I_{GSS}$    | $V_{GS} = \pm 30\text{ V}$ , $V_{DS} = 0$                                                                                   |                                                                                   |      | $\pm 200\text{ nA}$      |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$ , $V_{GS} = 0\text{ V}$<br>$T_J = 25^\circ\text{C}$<br>$T_J = 125^\circ\text{C}$                         |                                                                                   |      | 50 $\mu\text{A}$<br>2 mA |
| $R_{DS(on)}$ | $V_{GS} = 10\text{ V}$ , $I_D = 0.5 \cdot I_{D25}$<br>Pulse test, $t \leq 300\text{ }\mu\text{s}$ , duty cycle $d \leq 2\%$ |                                                                                   |      | 220 m $\Omega$           |

## PLUS247™ (IXFX)

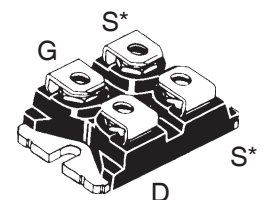


## TO-264 AA (IXFK)



## miniBLOC, SOT-227 B (IXFN)

E153432



\* Either Source terminal can be used as main or Kelvin source terminal

G = Gate  
S = Source  
D = Drain  
TAB = Drain

## Features

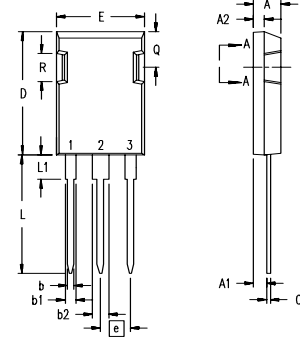
- Double metal process for low gate resistance
- International standard packages
- Epoxy meet UL 94 V-0, flammability classification
- Avalanche energy and current rated
- Fast intrinsic Rectifier
- miniBLOC package version with Aluminum Nitrate isolation

## Advantages

- Easy to mount
- Space savings
- High power density

| Symbol       | Test Conditions                                                                                                      | Characteristic Values<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified) |      |          |
|--------------|----------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------|----------|
|              |                                                                                                                      | min.                                                                              | typ. | max.     |
| $g_{fs}$     | $V_{DS} = 10\text{ V}$ ; $I_D = 0.5 \cdot I_{D25}$ , pulse test                                                      | 25                                                                                | 37   | S        |
| $C_{iss}$    | $V_{GS} = 0\text{ V}$ , $V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$                                                  |                                                                                   | 8340 | pF       |
| $C_{oss}$    |                                                                                                                      |                                                                                   | 890  | pF       |
| $C_{rss}$    |                                                                                                                      |                                                                                   | 175  | pF       |
| $t_{d(on)}$  | $V_{GS} = 10\text{ V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 0.5 \cdot I_{D25}$<br>$R_G = 1.0\ \Omega$ (External), |                                                                                   | 20   | ns       |
| $t_r$        |                                                                                                                      |                                                                                   | 16   | ns       |
| $t_{d(off)}$ |                                                                                                                      |                                                                                   | 60   | ns       |
| $t_f$        |                                                                                                                      |                                                                                   | 12   | ns       |
| $Q_{g(on)}$  | $V_{GS} = 10\text{ V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 0.5 \cdot I_{D25}$                                    |                                                                                   | 190  | nC       |
| $Q_{gs}$     |                                                                                                                      |                                                                                   | 44   | nC       |
| $Q_{gd}$     |                                                                                                                      |                                                                                   | 88   | nC       |
| $R_{thJC}$   | TO-264                                                                                                               |                                                                                   | 0.15 | 0.17 K/W |
| $R_{thCK}$   |                                                                                                                      |                                                                                   |      | K/W      |

### PLUS 247™ Outline



Terminals: 1 - Gate  
2 - Drain (Collector)  
3 - Source (Emitter)  
4 - Drain (Collector)

| Dim.           | Millimeter Min. | Millimeter Max. | Inches Min. | Inches Max. |
|----------------|-----------------|-----------------|-------------|-------------|
| A              | 4.83            | 5.21            | .190        | .205        |
| A <sub>1</sub> | 2.29            | 2.54            | .090        | .100        |
| A <sub>2</sub> | 1.91            | 2.16            | .075        | .085        |
| b              | 1.14            | 1.40            | .045        | .055        |
| b <sub>1</sub> | 1.91            | 2.13            | .075        | .084        |
| b <sub>2</sub> | 2.92            | 3.12            | .115        | .123        |
| C              | 0.61            | 0.80            | .024        | .031        |
| D              | 20.80           | 21.34           | .819        | .840        |
| E              | 15.75           | 16.13           | .620        | .635        |
| e              | 5.45 BSC        |                 | .215 BSC    |             |
| L              | 19.81           | 20.32           | .780        | .800        |
| L <sub>1</sub> | 3.81            | 4.32            | .150        | .170        |
| Q              | 5.59            | 6.20            | .220        | .244        |
| R              | 4.32            | 4.83            | .170        | .190        |

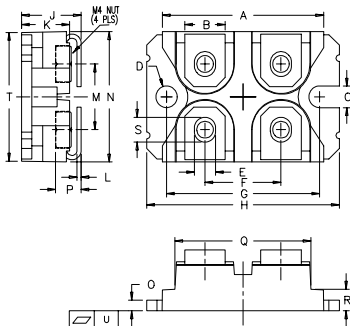
### Source-Drain Diode

### Characteristic Values

( $T_J = 25^\circ\text{C}$ , unless otherwise specified)

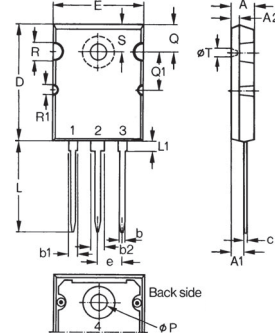
| Symbol   | Test Conditions                                                                                          | min. | typ. | max.          |
|----------|----------------------------------------------------------------------------------------------------------|------|------|---------------|
| $I_S$    | $V_{GS} = 0\text{ V}$                                                                                    |      |      | 38 A          |
| $I_{SM}$ | Repetitive; pulse width limited by $T_{JM}$                                                              |      |      | 150 A         |
| $V_{SD}$ | $I_F = I_S$ , $V_{GS} = 0\text{ V}$ ,<br>Pulse test, $t \leq 300\ \mu\text{s}$ , duty cycle $d \leq 2\%$ |      |      | 1.5 V         |
| $t_{rr}$ | $I_F = 25\text{ A}$ , $-di/dt = 100\text{ A}/\mu\text{s}$ , $V_R = 100\text{ V}$                         |      | 1    | 250 ns        |
| $Q_{RM}$ |                                                                                                          |      |      | $\mu\text{C}$ |
| $I_{RM}$ |                                                                                                          |      |      | A             |

### SOT-227B miniBLOC Outline



| SYM | INCHES |       | MILLIMETERS |       |
|-----|--------|-------|-------------|-------|
|     | MIN    | MAX   | MIN         | MAX   |
| A   | 1.240  | 1.255 | 31.50       | 31.88 |
| B   | .307   | .323  | 7.80        | 8.20  |
| C   | .161   | .169  | 4.09        | 4.29  |
| D   | .161   | .169  | 4.09        | 4.29  |
| E   | .161   | .169  | 4.09        | 4.29  |
| F   | .587   | .595  | 14.91       | 15.11 |
| G   | 1.186  | 1.193 | 30.12       | 30.30 |
| H   | 1.496  | 1.505 | 38.00       | 38.23 |
| J   | .460   | .481  | 11.68       | 12.22 |
| K   | .351   | .378  | 8.92        | 9.60  |
| L   | .030   | .033  | 0.76        | 0.84  |
| M   | .496   | .506  | 12.60       | 12.85 |
| N   | .990   | 1.001 | 25.15       | 25.42 |
| O   | .078   | .084  | 1.98        | 2.13  |
| P   | .195   | .235  | 4.95        | 5.97  |
| Q   | 1.045  | 1.059 | 26.54       | 26.90 |
| R   | .155   | .174  | 3.94        | 4.42  |
| S   | .186   | .191  | 4.72        | 4.85  |
| T   | .968   | .987  | 24.59       | 25.07 |
| U   | -.002  | .004  | -0.05       | 0.1   |

### TO-264 AA Outline



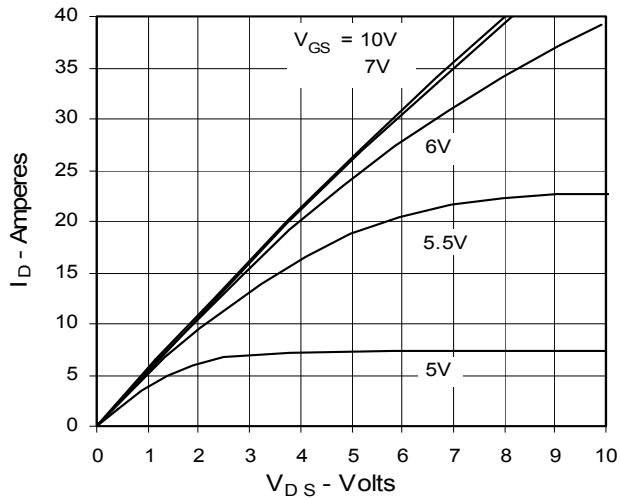
| Dim.           | Millimeter Min. | Millimeter Max. | Inches Min. | Inches Max. |
|----------------|-----------------|-----------------|-------------|-------------|
| A              | 4.82            | 5.13            | .190        | .202        |
| A <sub>1</sub> | 2.54            | 2.89            | .100        | .114        |
| A <sub>2</sub> | 2.00            | 2.10            | .079        | .083        |
| b              | 1.12            | 1.42            | .044        | .056        |
| b <sub>1</sub> | 2.39            | 2.69            | .094        | .106        |
| b <sub>2</sub> | 2.90            | 3.09            | .114        | .122        |
| c              | 0.53            | 0.83            | .021        | .033        |
| D              | 25.91           | 26.16           | 1.020       | 1.030       |
| E              | 19.81           | 19.96           | .780        | .786        |
| e              | 5.46 BSC        |                 | .215 BSC    |             |
| J              | 0.00            | 0.25            | .000        | .010        |
| K              | 0.00            | 0.25            | .000        | .010        |
| L              | 20.32           | 20.83           | .800        | .820        |
| L <sub>1</sub> | 2.29            | 2.59            | .090        | .102        |
| P              | 3.17            | 3.66            | .125        | .144        |
| Q              | 6.07            | 6.27            | .239        | .247        |
| Q <sub>1</sub> | 8.38            | 8.69            | .330        | .342        |
| R              | 3.81            | 4.32            | .150        | .170        |
| R <sub>1</sub> | 1.78            | 2.29            | .070        | .090        |
| S              | 6.04            | 6.30            | .238        | .248        |
| T              | 1.57            | 1.83            | .062        | .072        |

IXYS reserves the right to change limits, test conditions, and dimensions.

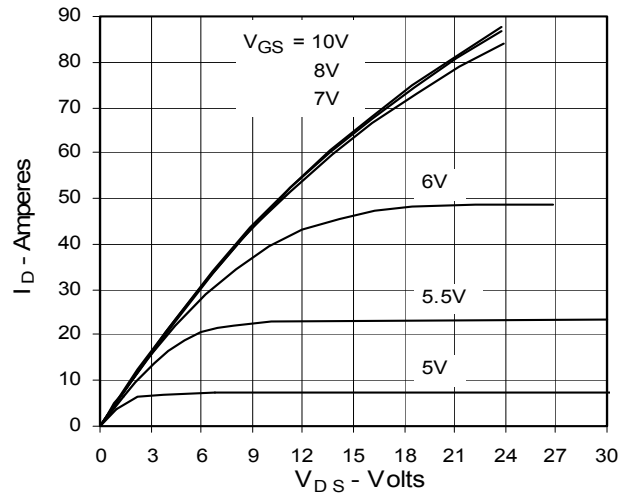
IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents:

|           |           |           |           |              |              |              |           |
|-----------|-----------|-----------|-----------|--------------|--------------|--------------|-----------|
| 4,835,592 | 4,931,844 | 5,049,961 | 5,237,481 | 6,162,665    | 6,404,065 B1 | 6,683,344    | 6,727,585 |
| 4,850,072 | 5,017,508 | 5,063,307 | 5,381,025 | 6,259,123 B1 | 6,534,343    | 6,710,405 B2 | 6,759,692 |
| 4,881,106 | 5,034,796 | 5,187,117 | 5,486,715 | 6,306,728 B1 | 6,583,505    | 6,710,463    |           |

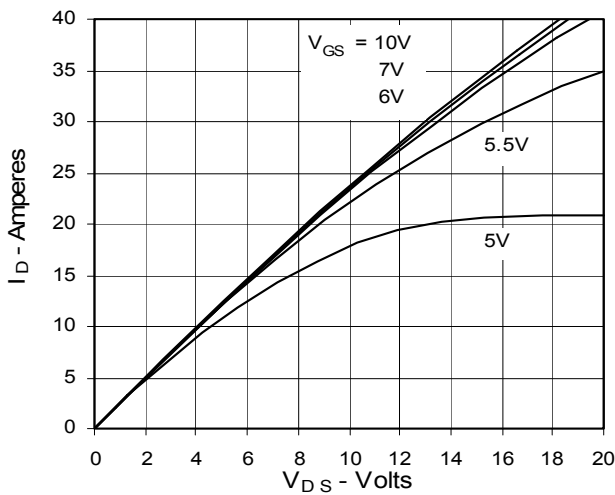
**Fig. 1. Output Characteristics  
@ 25°C**



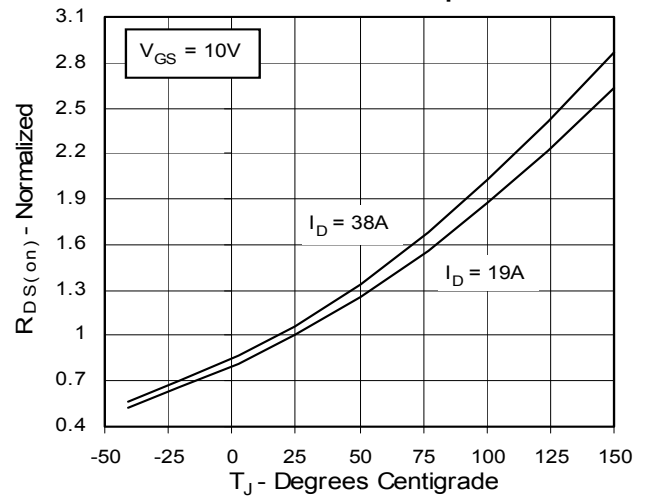
**Fig. 2. Extended Output Characteristics  
@ 25°C**



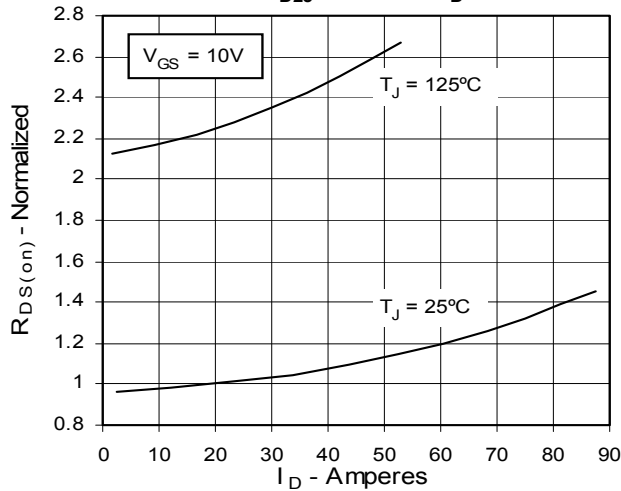
**Fig. 3. Output Characteristics  
@ 125°C**



**Fig. 4.  $R_{DS(on)}$  Normalized to 0.5  $I_{D25}$   
Value vs. Junction Temperature**



**Fig. 5.  $R_{DS(on)}$  Normalized to  
0.5  $I_{D25}$  Value vs.  $I_D$**



**Fig. 6. Drain Current vs. Case  
Temperature**

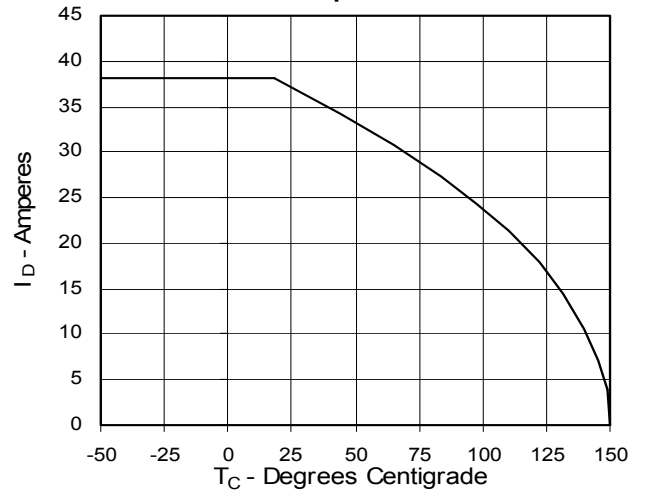


Fig. 7. Input Admittance

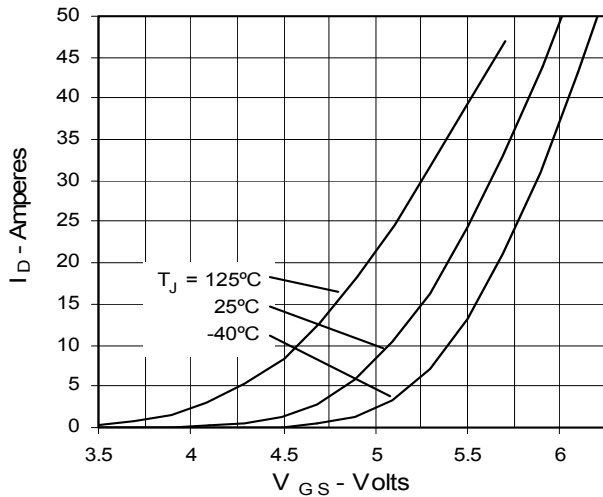


Fig. 8. Transconductance

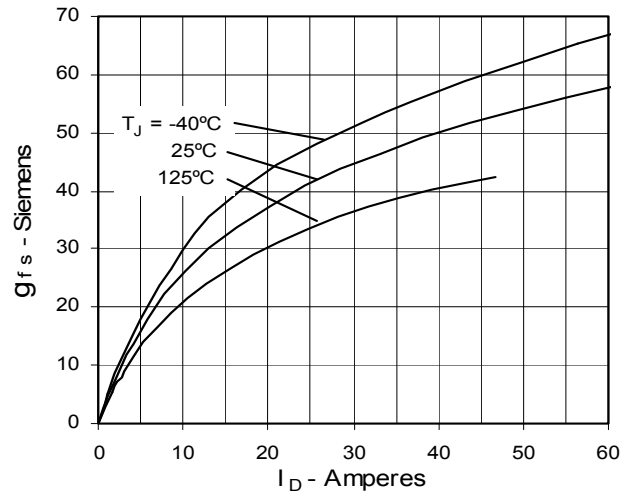


Fig. 9. Source Current vs. Source-To-Drain Voltage

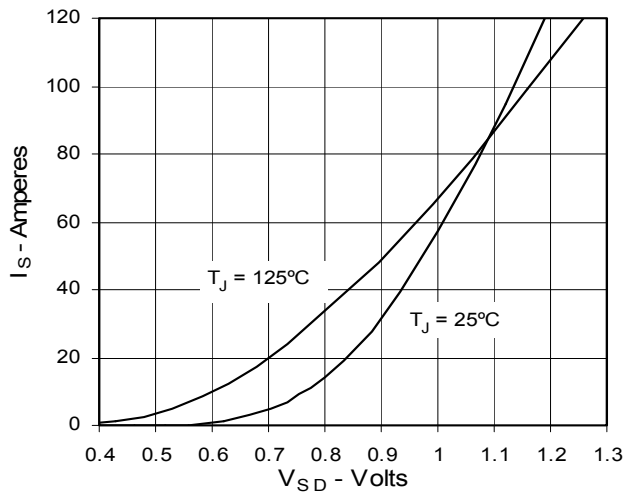


Fig. 10. Gate Charge

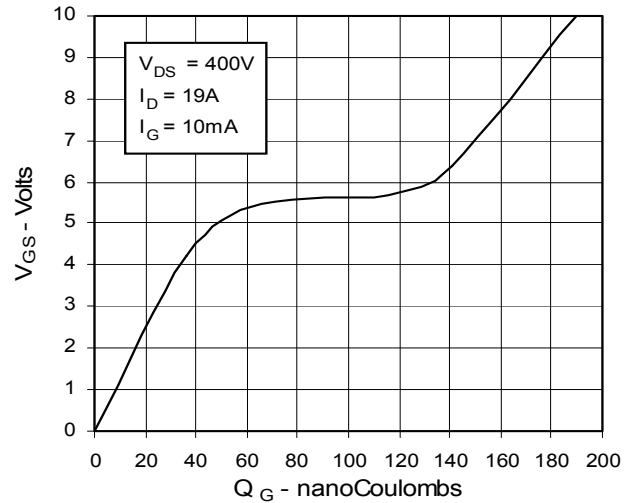


Fig. 11. Capacitance

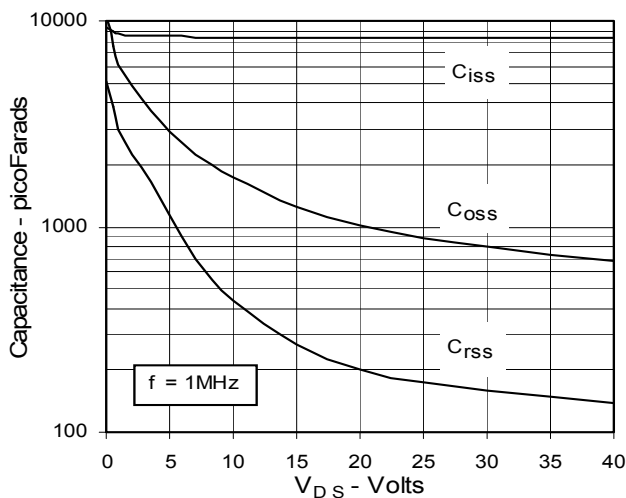


Fig. 12. Forward-Bias Safe Operating Area

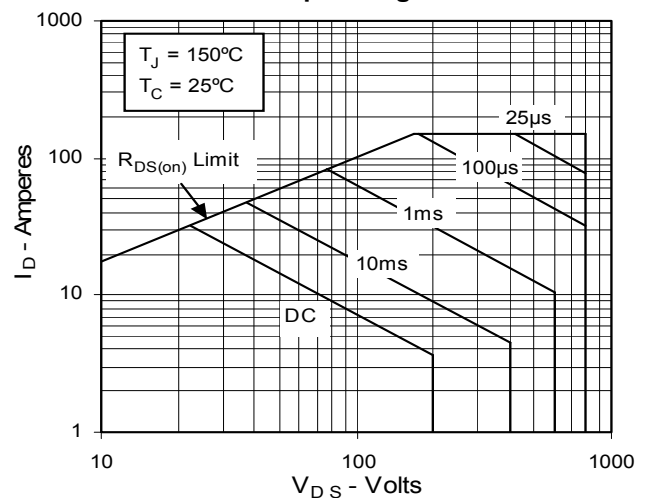


Fig. 13. Maximum Transient Thermal Resistance

